

CHAPTER M4

TABLE OF CONTENTS

Section I	General Information
M4.00	General
M4.01	Scope of Chapter
M4.02	Levels of Maintenance
M4.03	Reporting Requirements
M4.04	Responsibility
Section II	Signs
M4.05	Sign Acquisition
M4.06	Selection of Signs
M4.07	Classification of Signs
M4.08	Sign Materials
M4.09	Storage and Handling of Signs
M4.10	Installation of Signs
M4.11	Sign Maintenance
M4.12	Hidden Signs
M4.13	Obsolete Signs
M4.14	Temporary Signs

Section III Supports

M4.15 General

M4.16 Wood Posts

M4.17 Steel Posts -- Small Signs

M4.18 Timber Poles

M4.19 Laminated Wood Posts

M4.20 Breakaway Steel Posts for Use with Large Signs

M4.21 Overhead Steel Sign Supports

M4.22 Hardware

M4.23 Supplemental Information

Section I: General Information**M4.00 General**

This Chapter covers the maintenance of permanent signs placed on the state highway system for the purpose of warning, regulating, or guiding traffic.

The Chapter includes three sections:

Section I: General Information
Section II: Signs
Section III: Supports

M4.01 Scope of Chapter

Typical sign work may include the following:

- (A) Placing of posts and/or signs,
- (B) Identification of damaged or inadequate signs,
- (C) Initiation of the reordering process for replacement signs,
- (D) Preparation of accident damage reports (R 103),
- (E) Painting of steel structures supporting overhead signs,
- (F) Tightening of bolts and screws,
- (G) Assembly of sign panels for temporary use in place of badly damaged signs,
- (H) Cleaning of dirty signs; and
- (I) General inspection duties.

M4.02 Levels of Maintenance

Levels of Maintenance, including frequency and priority of action, are included in Volume 2 of the Maintenance Manual, M Family, for budgeting purposes. Levels may vary depending on overall appropriation of funds by the Legislature.

Signs not properly maintained present a poor appearance and have diminished effectiveness in authority as traffic control devices.

Periodic inspection to detect deficiencies, which require corrective action, is an important part of proper sign maintenance.

In general, signs critical to traffic safety or operations should be repaired or replaced promptly.

If prompt corrective action is not possible, a temporary sign should be installed until permanent repair or replacement can be made. Sign deficiencies not critical to traffic safety or operations should be taken care of as soon as practicable to prevent the loss of capital investment.

Sign inspection may be performed during daylight hours or at night. Effects of age, weathering, and vandalism are sometimes difficult to detect unless the sign is observed at night. A night check should be made immediately following a grass or range-land fire as heat can cause loss of reflectivity.

Formal sign inspection is performed annually and includes a night review. If specifically requested, results are reported to the Maintenance Program. When reports are not requested, the records should be kept on file for a minimum of three years. Routine or informal sign inspections are performed on an "as-needed" basis, or under the general guideline of twice a year. Informal sign inspections are not reported to the Maintenance Program.

The supervisor of the sign crew, or the "sign person" where sign crews do not exist, shall have the primary responsibility for detecting and reporting sign deficiencies. However, all employees should be instructed to report damaged, non-performing, or obscured signs whenever noted.

District Traffic Operations may also aid in determining the adequacy of signs.

The following are general guidelines for performing sign inspections at night:

- (A) It is important that the inspection vehicle headlamps be properly adjusted. Headlamps should be in the dimmed position for night sign inspection.
- (B) Conduct inspections safely. Try to blend with the flow of traffic. If it is absolutely necessary to slow or stop on the shoulder close to the traveled way, use a flashing light, amber rotating light, or light bar. A hard hat and reflective vest shall be worn if the sign inspector leaves the inspection vehicle. Reflective material on the hard hat is optional.

- (C) The inspection team usually consists of two or three employees. One member of the team should be a qualified sign maintenance person. Traffic Branch employees should be invited to participate.
- (D) It is not necessary that inspectors have good visual perception. It is necessary, however, that at least one team member have good color vision for evaluating sign colors.

Decisions regarding the adequacy of borderline signs should be based on the combined judgment of the team.

- (E) Signs should be observed at the "distance of driver need". This distance varies depending on factors such as average speed and roadway alignment. For the average highway, however, observations should be made 250 feet to 500 feet in advance of the sign. For city streets, where average speeds are generally lower, sign observations maybe made closer to the sign.
- (F) The inspection vehicle should normally be driven in the outside lane of multilane highway. This is generally the safest path of travel for the night inspection team. It also places the team in a position where signs hidden by vegetation will be noted. The team should not park on the shoulder to evaluate reflectivity of a sign unless such practice is necessary for reasons of safety (shoulder mounted signs appear brighter when viewed from the shoulder than when viewed from the traveled way).
- (G) Median mounted signs may be observed from the number one lane if it is safe to do so.
- (H) It may be necessary to make two inspection passes for sections of highway where both median mounted and shoulder mounted signs are to be observed. "STOP" signs and "STOP AHEAD" signs on county road approaches to state highways shall be checked.
- (I) Do not use a spotlight to evaluate night sign reflectivity. The spotlight is several times brighter than vehicle headlamps. This causes false observations of sign brightness.
- (J) The adequacy of sign reflectivity is not based on specific levels of brightness. Rather, it is based on the best judgment of the night inspection team. Typical factors to consider when making decisions regarding sign adequacy are:
 - (1) Whether the sign difficult to see because it is in front of a lighted background (as may be the case in urban areas).

- (2) Whether there competition for driver attention in the area of the sign. If the answer to either of these questions is "yes", a brighter sign may be needed at those specific locations.
- (3) The "degree of hazard" associated with the sign message.

The sign condition report form for signs needing work must be completed accurately to assure that appropriate corrective action will be taken. Budgeting, staffing, and work scheduling are typical uses of reported data.

Signs that are not adequate because they are dirty or hidden by vegetation should not be reported as deficient. These signs should be noted and reported to the appropriate Maintenance Supervisor for action. Trimming or removing vegetation or relocating the sign are corrective action alternatives for hidden signs. Sign relocation requires approval of the Traffic Branch.

In addition to general physical inspections of overhead signs by sign maintenance personnel, an engineering inspection of overhead sign structures should be made at least every five years. The engineering inspection includes all portions of the structure, safety devices, mechanical and electrical equipment and other items, which need attention.

Maintenance effort on major changeable message signs (permanent type) is reported to the K Family, Electrical. Required maintenance on steel sign structures supporting those signs are reported to the M Family. Small changeable message signs that are turned or opened by hand for viewing are reported to the particular family/problem requiring use of the sign.

M4.03 Reporting Requirements

Only permanent regulatory, warning and guide sign needs are to be reported to the M4 Family/ Problem for recording in the Maintenance Management System. All operational snow signs; signs within roadside rests, park and ride lots, weigh stations, etc.; and construction zone signs are to be reported to the respective Family/Problem concerned. Electrical work on signs is to be reported in the K Family. A description of Family/Problems is found in Volume 2 of the Maintenance Manual.

The Maintenance Program has established codes for Family/Problems and special designations identifying types of work performed, units of production, and costs of work. Management decisions are often based on analyses of the coded entries. Therefore, special care should be taken to assure that the coded information entered by Maintenance personnel is accurate.

Sign Maintenance funds must, by statute, be used for replacement or maintenance of signs.

When a sign is replaced, the new sign must essentially be the same as the one it is replacing to qualify for Maintenance funding. New installations, if performed by Maintenance, or replacement signs that are new in shape, size, or message, are upgrades, and shall be charged to improvement allocations. These must be authorized by an Installation Order issued by District Traffic Operations.

M4.04 Responsibility

Permanent signs, should be installed by persons who are trained for that particular work. Sign materials are relatively delicate and are easily damaged.

An untrained person may not know proper methods of transporting or displaying sign messages, protecting sign materials, or using equipment to safely complete the installation.

New installations, with the exception of temporary emergency signs, are not to be made without approval of District Traffic Operations. Temporary signs required by unusual conditions or restrictions may be installed without an installation order from the Traffic Branch.

However, such temporary signs shall be removed or covered immediately when those conditions cease to exist or restrictions are withdrawn.

Traffic Branch Installation Orders should show location of the sign, type of sign, type of material, type of support, size of letters, and color. Questions regarding IOs should be directed to District Traffic Operations.

The Office of Structures Maintenance and Investigation, Division of Structures, is responsible for keeping an inventory of overhead and changeable message signs and providing periodic engineering investigations. Sign numbers in the overhead sign inventory are assigned by the District. The District is responsible for maintenance of overhead signs and sign structures, including both routine and special work recommended by the Office of Structures Maintenance and Investigation.

A significant amount of sign damage occurs in mountain areas due to snow removal activities. It is important that this type of damage be minimized. Unnecessary damage that requires repair or replacement of signs causes waste of Maintenance resources.

It is general policy for the Department to install and maintain permanent signs on State highways within incorporated cities or counties. When possible, districts should delegate the installation and maintenance of warning and regulatory signs to cities and counties equipped to do the work.

However, the responsibility for assuring that these signs are adequately maintained remains with the State.

Maintenance of "Trailblazer" signs, which direct traffic on city or county streets and roads to the State highway system may be performed by local jurisdictions or with State forces. Caltrans, however, has the ultimate responsibility for maintenance of such signs placed by the State off the highway system.

The Department will normally not install or pay for the installation of parking regulatory signs within cities or counties. These signs are usually placed to inform the motoring public of ordinances and police regulations within the local agency and may have little to do with operation of the state facility.

The Department is frequently called upon to install signs for private parties, including STOP signs for subdivisions, directional signs for golf clubs, and so forth. Other State agencies, cities and counties also request signs. All such requests are referred to District Traffic Operations. An Encroachment Permit will be required before work is performed for or by others. Costs are billed to the requesting party.

Maintenance of signs placed off the highway right of way may be an obligation of the Department when the sign is primarily placed for protection of traffic on the state facility. Examples are the STOP AHEAD (Code W17) signs placed on roads approaching the state highway. It is standard practice for Caltrans to fund the initial installation and future maintenance of such signs for existing road connections, after obtaining necessary permission from the local agencies involved.

Where a new entrance to a State highway is provided under an encroachment permit, the other agency will be responsible for initial installation of the signs. The signs will be maintained by Caltrans in the future.

Districts are responsible for the placement and maintenance of limit lines (stop bars) at both existing and new paved approaches to a state highway. A STOP pavement marking should also be placed and maintained when directed by the Traffic Branch. Districts will coordinate the work of the sign and stencil crews for these installations.

Any unauthorized sign placed on the highway right of way by a private organization or individual constitutes a public nuisance and shall be removed.

Before relinquishment of any state route to a local agency, all signs must be in good repair.

Statutes providing for relinquishment exempt only the U.S., interstate, county, and State route shields that are to be removed prior to the time the route is actually turned over to the local authorities.

Section II: Signs

M4.05 Sign Acquisition

Signs listed in the Material Operations Warehouse Catalog shall be ordered through the Material Management system on a Local Request, EDP Form DAS-OBM-1001C.

Special signs, not listed in the catalog, should be ordered on a Purchase Request, Form DAS-OBM-1005 in accordance with current instructions. Except for signs placed in stock, District Traffic Operations is responsible for ordering most signs.

Attention is called to the emergency clause in the sign contracts, which provide for a 21 day delivery period, after the order is received by the contractor. Signs made under this provision will be direct shipped to the ordering district. Shipping charges and a markup for special handling will be billed to the receiving district. Except for temporary and emergency signs, there is minimal need, if any, for maintenance personnel to fabricate signs.

M4.06 Selection of Signs

The broader use of symbol signs, in preference to word messages, is desirable. Educational plates accompany some symbol signs to explain in words the meaning of the new symbol.

Unless otherwise directed by the Traffic Branch, educational plates should remain in place for at least three years after initial installation. No special effort will be made to remove educational plates as long as they are in serviceable condition.

Signs placed on State highways must comply with provisions of the Vehicle Code and other Statutes. The basic requirements of a highway sign are that it be legible and understood in time to permit a proper response.

Only warning, regulatory, or construction signs may be supplemented by flashing beacons.

M4.07 Classifications of Signs

Highway signs are grouped into four general classifications: Warning, Regulatory, Guide, and Construction. Designated shapes and colors are used to differentiate between the different sign classifications. Persons installing signs must make certain that the distinctive silhouette shape of a sign is not blocked by other signs mounted above, below, along side, or behind the sign. Other signs shall not be mounted back-to-back with the STOP (R-1) or the YIELD (R1-2) signs.

Regulatory and warning signs, unless excepted in the standards covering a particular sign or group of signs, shall be reflectorized and/or illuminated to show the same shape and color by day and night.

The Traffic Manual contains detailed information on signs and sign policies. All persons installing signs should have available a copy of Chapter 4 of the Traffic Manual for ready reference. The Uniform Sign Chart is a listing of some of the more common signs.

An 8 ½ inch (215.9 meters) by 11 inch (279.4 meters) copy of the Uniform Sign Chart should be in every sign truck. In addition, the Traffic Branch has detailed drawings and specifications available for installing signs under most situations existing on the highway system.

(A) Warning Signs

Warning signs are placed to alert drivers to road conditions which may not be reasonably apparent to, and may not have been anticipated by, a motorist exercising due care. Maintenance and/or replacement of warning signs should have top priority over all but a few types of regulatory signs.

Warning signs are generally diamond shaped with black legend and border on a yellow background. Exceptions are the railroad crossing sign (round), the symbolic school crossing sign, changeable message signs, and the rectangular shape used for supplemental signs (such as advisory speed signs) mounted below and on the same post with other warning signs.

Warning signs set up specifically for construction zones shall have a black legend and border on an orange reflective background.

(B) Regulatory Signs

Regulatory signs are used to inform motorists of regulations that apply at definite locations, specific times, or where the regulations are not self-evident. This group includes signs regulating the movement, speed, stopping, or parking of vehicles.

Regulatory signs are generally black and white or red and white.

The general shape of a regulatory sign is rectangular. The shape of a stop sign is an octagon and a yield sign is an inverted triangle. Signs for regulations, which are in effect at night, are reflectorized, but non-reflectorized signs may be used at locations where night enforcement is not a problem. Two signs for different purposes should not normally be mounted on the same post.

DO NOT ENTER (Code RI1) and DO NOT PASS (Code R63) are examples of signs which have high priority for early replacement or maintenance.

(C) Guide Signs

The purpose of guide signs is to provide directional, route, recreational, and roadside service information. Guide sign colors are generally green, blue, or brown with white legends and border.

The priority for maintenance or replacement of guide signs, depends on the needs of motorists in a particular area.

Flashing lights or distracting legends shall not be placed on guide signs.

Unless otherwise approved by the Traffic Branch, a minimum spacing of 200 feet (60.96 meters) between guide signs shall be maintained on conventional highways.

A minimum spacing of 800 feet (243.84 meters) should be maintained on freeways and expressways.

(D) Construction Zone Signs

These signs are used to caution motorists in advance of and through, construction and maintenance work zones. Temporary signs for use in construction and maintenance work zones, shall have a black legend and border on an orange background.

M4.08 Sign Materials

All new materials used for traffic signs, must be approved by the New Products Committee.

This committee evaluates products before general use to assure that proposed materials provide adequate performance. In cooperation with the Office of Materials Engineering and Testing Services, the committee also evaluates the service life potential of new products. The Office of Structure Design, Division of Structures, is responsible for structural design of the sign.

Materials used in the manufacture of signs serve three basic functions:

- (A) Sign substrates provide stiffness as well as a suitable surface for background materials such as paint or reflective sheeting. Most current sign substrates are a single thickness of aluminum. Other substrates use aluminum sheet for front and back surfaces with a paper core between, forming a "sandwich" type laminated panel. Steel was used as substrate material for many of the older overhead signs. Substrates such as plywood may be used for special applications but are not approved for general use.
- (B) Sign background provides a colored surface, which contrasts with the sign, message (legend) and border allowing the motorist to clearly read the sign message. The background also serves to attract attention of the motorist. Background colors are coded to explain the primary purpose of the message. Background materials for most warning, regulatory, and construction signs are made of reflective sheeting. Most guide, service and recreational sign backgrounds are non-reflective paint, or porcelain.
- (C) Sign legends convey the message while borders outline the message making it more visible to the motorist. Sign legends and borders are reflectorized for most guide, service, and recreational signs. Warning, regulatory and construction signs generally utilize black non-reflectorized, legends and borders.

M4.09 Storage and Handling of Signs

Sign materials can be easily damaged by improper storage or careless handling.

It is important that signs and sign supports be protected in storage and transporting as well as during and after installation. The supervisor is responsible for assuring that signs are handled with proper care at all times.

Proper storage techniques prevent damage such as scratching of sign surfaces or warping of wood sign supports. Although proper storage is generally a matter of using common sense, certain types of sign supports and signs may require special storage techniques. Direct inquiries regarding special storage requirements to the Office of Materials Engineering and Testing Services.

Laminated panel signs normally have small weep holes in the channel at the bottom edge. This allows moisture that enters the panel from bullet holes and other damage to drain, thereby preserving the sign's structural integrity. If the panel is stored upside down or if it is reused and installed upside down, the weep holes allow water to enter the panel rather than helping drain accumulated water. Any unneeded holes observed in laminated panel signs should be plugged or sealed to prevent moisture intrusion.

Storage of signs in vehicles used by sign crews is of special concern. Rubbing and marring of surfaces of on-board signs is caused by vibration of the vehicle during travel. A sign can be seriously damaged in this manner before it is installed. Signs carried in a sign repair vehicle should be kept to the minimum number and types necessary to adequately respond to short-term needs. Do not permit reflective sheeting signs to rub against each other or against abrasive parts of the sign repair vehicle.

Proper storage of wood sign supports in maintenance yards is important. Sign posts stored flat on the ground or on asphalt can be warped beyond use. Care should be taken to support wood posts above ground level. This reduces warping and cracking by allowing air to circulate providing more uniform moisture and temperature conditions around the sign supports. Refer to Section M4.25 for storage of laminated box-beam signposts.

Treated wood posts must be stored under cover or tarped to prevent chemical runoff from entering drainage systems. Special care is needed in storage and transporting large signs to prevent warping the entire sign structure, marring the sign surface, bending edges, and breaking reflector button legends and borders. Large signs should be stored on edge rather than flat. Flat storage can cause warping and entraps moisture, which often damages sign materials. When stored on edge, it is important that the edge of one sign is not bearing directly against the face of an adjacent sign. Sign edges can easily damage reflector button legend and border.

M4.10 Installation of Signs

Installation of signs should be a carefully planned activity. Good planning improves efficiency of the installation procedure, minimizes interference with the traveling public, and assures that potential safety problems are considered.

An important part of the planning process for installing signs is determining the location of underground and overhead utilities. Prior to digging, supervisors shall for notifying utility companies of intended work through Underground Service Alert (USA), as outlined in Chapter 1 of this Manual, Section 1.27. Serious accidents can result if this step is overlooked. Exercise care when digging in landscaped areas to avoid buried water lines.

Current details for the location and position of signs are included for general information in the plates at the end of this chapter. These details are periodically updated and field crews should make sure they have the latest plans when maintaining signs. Additional information is available in the Standard Plans and in the Traffic Manual.

The desired result of the sign installation process is that signs effectively communicate information to motorists. Placement of signs along a highway should be spaced to allow motorists time to assimilate the message. Spacing should be determined in "Units of Time" based on the expected approach speed.

The following general rule is good practice:

If possible, signs should be at least 500 feet (152.4 meters) apart. A desired minimum spacing for Guide Signs is 800 feet (243.84 meters) on freeways and expressways, and 200 feet (60.96 meters) on conventional roads. District Traffic Operations should be contacted to resolve questions about location or position of a sign.

Sign installation can be as simple as digging a hole for a small one-post roadside sign or as complex as mounting large multi-panel signs on overhead sign structures. In either case, use care to avoid damaging the sign while handling. In a multiple-post installation, install posts before the large sign is installed. This will reduce possible damage to the signs. Use fixtures that have been specifically designed for sign handling.

Proper installation procedure is important to ensure long-term service life. Position post holes correctly. The bottom of holes for wood posts should be wetted, tamped, and leveled before posts are installed. In all cases, signs should be level and posts should be plumb.

Safe work practices, including wearing gloves and hard hats, safety glasses and other equipment as necessary to avoid injury to sign crew members. Supervisors should regularly review the appropriate Maintenance Codes of Safe Operating Practices with their crews.

Different sign support systems require different hardware and installation procedures. Hardware is approved for use based on testing procedures designed to assure maximum safety for the motorist. Maintenance personnel shall not use alternate hardware without prior approval of the Maintenance Program.

Large ground-mounted signs cost several thousand dollars each. Preventable sign damage is an unnecessary drain on Maintenance resources.

Districts should take action as follows to reduce preventable sign damage to the greatest extent possible:

- (A) Identify large signs that may be subject to damage from careless drivers. Damage usually occurs when the lower left corners of these signs are hit by large, slow moving vehicles.
- (B) If feasible and economical, Districts should consider relocating such signs during scheduled maintenance replacement work.
- (C) When relocation is not feasible, a guide marker (delineator post) may be installed in alignment with and in advance of the sign in a position that may keep vehicles from hitting the sign. These markers should be reflectorized only where such installation will not diminish the effectiveness of existing roadside guide markers (to the extent of confusing the motorist).
- (D) Any measures taken to prevent damage to ground-mounted signs must be consistent with the policy of providing a safe roadside environment. District Traffic should be contacted for approval of any unusual measures that may be necessary to protect signs from vehicular damage.
- (E) When replacing either damaged guide or regulatory signs, consider relocating these signs where they will be less susceptible to damage. This may mean that some signs will be located in less than the ideal position. Written authorization must be obtained from District Traffic Operations before any significant relocation of a sign.
- (F) Landscape irrigation systems are another source of sign damage. Water spots, streaking, loss of reflectivity and corrosion can result from sprinkler heads directing water onto the sign panels. In addition to damage to the sign panels, wood sign posts (especially laminated wood sign posts) can be severely damaged by repetitive spraying from landscape sprinkler systems.

Damage can be eliminated or reduced by making minor field adjustments to the sprinkler system to avoid spraying adjacent sign panels and wood posts. It may be necessary to move the signs to another location.

- (G) Nonstandard installations may be justified where special circumstances exist.
- (1) Damage to signs can be reduced in heavy snow removal areas by modifying normal installation procedures. Laminated panels may be offset so the overhang on the roadside edge is reduced. In addition, laminated panel signs should be ordered in the 2 ½ inch (63.5 millimeters) thickness to provide the stiffness necessary to resist snow loads. This has proven effective in reducing the number of signs damaged during snow removal activities.
 - (2) Upon request, District Traffic Operations can reduce the size of a sign by "stacking the message" thereby reducing the surface area exposed to the elements.
 - (3) Single sheet warning and regulatory signs, may be reinforced, by backing the new sign, with a salvaged aluminum blank. The new sign can be riveted to the salvaged sign to obtain greater stiffness.
 - (4) One-post directional signs for installation within sidewalk areas of cities and towns should generally be ordered for off-center installation. The post, located at the left-hand edge of the sign face, may then be placed near the curb where it will not interfere with pedestrian traffic.
 - (5) Two-post signs are more difficult to install in sidewalk areas. When necessary, one post should be placed at or near the curb line with the second post at or near the property line. The sign may then be mounted on 2 inch x 4 inch (50.8 millimeters x 101.6 millimeters) placed horizontally between the posts. Property owners have objected to this type of installation, and it should only be used when a sign is too long for one-post mounting.

M4.11 Sign Maintenance

No definite rule has been established to determine when a sign is damaged beyond repair or when a sign should be repaired and retained in service. In general, a sign should be replaced if it cannot economically be repaired to present a neat appearance. Sign maintenance personnel should rely on experience. Historical data and best judgment to arrive at cost-effective decisions regarding sign maintenance.

Washing or cleaning signs is a proper sign maintenance activity, but only if it is cost-effective.

In certain situations, the better alternative may be to replace rather than wash or clean a sign.

Special programs people may be used to make washing signs a cost-effective alternative to replacement.

Specific methods and materials are recommended for repairing different types of signs.

Questions regarding materials used for repairing and cleaning signs should be directed to the Office of Materials Engineering and Testing Services. This is especially important with regard to reflective sheeting signs because the sheeting surface is easily damaged by use of improper cleaning agents. Questions regarding specific methods of sign installation or maintenance may be directed to the Maintenance Program.

The variety of tasks involved in the maintenance of signs means that Districts must exercise judgment to arrive at cost-effective choices in terms of how best to utilize available Maintenance resources. Ultimately, the Districts are responsible for making proper, cost-effective decisions regarding sign maintenance.

M4.12 Hidden Signs

Landscape plantings maturing along many miles of highways have increased the number of signs obscured by plants. Signs hidden by natural vegetation or designed landscaping are of no benefit to the motorist. Corrective alternatives should be considered in the following order when signs are hidden:

- (A) Is the sign necessary? (Check with Traffic for guidance.)
- (B) Can the sign be economically moved to a better location?
- (C) Is it feasible to trim vegetation to the extent that the sign can be seen?
- (D) If periodic trimming has been necessary, would removal of the tree or other vegetation be a better alternative?

Occasionally, signs may be hidden by other signs, or sight restrictions, such as cut slopes or buildings. Notify the Traffic Branch when this occurs for direction regarding appropriate corrective action.

M4.13 Obsolete Signs

Periodically, some signs are eliminated, or changes are made in messages, designs, sizes, or colors. The result is that existing signs become obsolete, even though they may adequately serve the intended purpose for many years. Unless otherwise directed by the Traffic Engineer, such signs should remain in service until normal maintenance replacement is required. Directed replacement of signs before the end of normal service life is considered "betterment", and such costs must be from improvement funds.

Obsolete signs in inventory that have not yet been installed should be returned to a Material Operations warehouse for disposal.

Speedometer check signs are being phased out. When a speedometer check sign in a series of speedometer check signs is damaged, that sign and all others in that series should be removed, eliminating the installation.

M4.14 Temporary Signs

Temporary signs shall be maintained only as long as the need for that sign exists. When the need no longer exists, temporary signs shall be removed or covered completely. It is not acceptable practice to cover the sign message only.

Temporary signs for nighttime use shall have a reflectorized background and/or legend and border depending on the standards for that particular sign. Temporary signs shall also conform to the color, size, material, and other requirements, which apply to permanent signs of that type, unless otherwise specifically authorized in writing by District Traffic Operations. Depending on the type of sign and expected usage, the service life of temporary sign materials may be somewhat less than that used for permanent signs.

Districts shall keep an adequate inventory of materials available for immediate fabrication of emergency signs.

Section III: Supports**M4.15 General**

Types and sizes of ground-mounted sign supports should be initially chosen on the basis of:

- (A) Safety in the event of a hit by an errant vehicle.
- (B) Ability to withstand a "blow down" in heavy wind, depending on the size of the sign.
- (C) Cost analysis considering both the initial cost of the support and the ongoing, future cost of maintenance.
- (D) Aesthetics or compatibility with surrounding features.

Current Statutes prevent the use of Maintenance funds for upgrading posts (bringing existing posts to current standards). However, Districts have the option of reviewing each sign location using future maintenance costs as a criterion for recommending a change in type of sign support.

With proper documentation and concurrence of District Traffic Operations, the type of support can be changed to provide a more cost-effective installation when replacement is warranted.

Safety of the public shall always be included in such a review.

Holes shall not be drilled in light standards for the purpose of installing signs. Signs at these locations shall be banded to the post using standard hardware designed for this purpose.

Hidden depressions resulting from post removal present a hazard to workers and should never be left unfilled when installations are abandoned. Make contractors and permit holders aware of the problem.

M4.16 Wood Posts

Dimensioned wood posts have long history of success as sign supports for smaller ground-mounted signs. Wood posts may still be the most cost-effective installation, especially in locations where it is unlikely they can be hit (e.g., behind guardrail). Unless conditions otherwise dictate, the wood post is the primary sign support structure used.

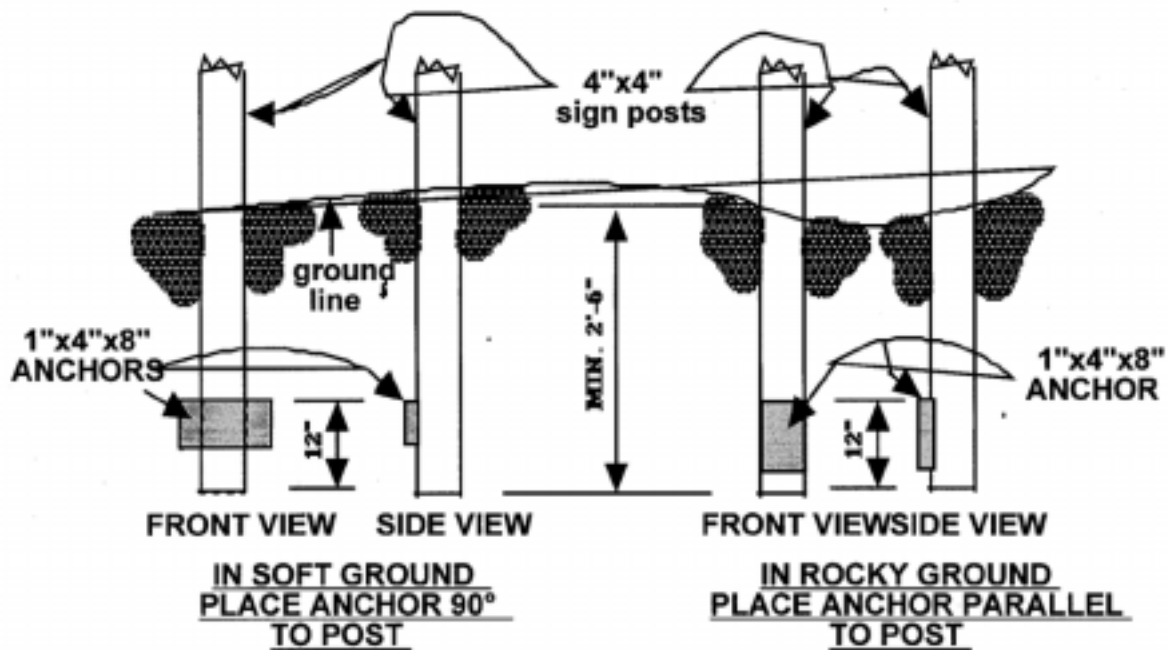
Where needed, holes are to be drilled in the larger wood posts to provide a weakened plane for breakage when the post is impacted by a vehicle. It is important to make sure the holes are drilled at the specified height above the ground. The holes are placed at this height so the broken end protruding above the ground will not snag the bottom of a car. See current Standard Plan sheets for details on hole locations.

Anchor blocks may be used on wood posts where signs are located in soft ground, near schools, and at locations frequently used by pedestrians. The anchor blocks prevent the sign from being rotated in the hole, lifted out, or stolen.

Wood sign posts shall not be painted.

When handling treated wood posts, skin contact shall be avoided. Wear long sleeved shirt and gloves and avoid breathing wood dust when sawing or drilling posts.

ANCHOR BLOCKS FOR WOOD SIGN POSTS



M4.17 Steel Posts-Small Signs

Several patented breakaway metal post systems for small signs have been approved for operational use. The use of breakaway metal post systems has both advantages and disadvantages.

- (A) Advantages of breakaway metal post systems are:
 - (1) Relative ease of installation (no need to dig a hole);
 - (2) Possible reuse of the base post after vehicular impact, with resultant long-term cost savings; and
 - (3) Improvement in motorist safety provided by the breakaway feature.
- (B) Disadvantages of metal post systems are:
 - (1) Posts are not interchangeable. Once a base post is placed, there is no economically feasible alternative except to purchase replacement posts of the same design;
 - (2) A variety of driving heads, bolts, and other materials must be carried in the sign truck to permit repairs or modifications to different installations;
 - (3) Underground utilities may be damaged when driving the post; and
 - (4) Different methods of attaching signs to posts may require strengthening of some sign panels to prevent excessive bending and distortion of the sign message.
- (C) Special installations where the breakaway metal sign post system can be an acceptable alternative to wood posts, based on life-cycle cost, are:
 - (1) Areas with a high incidence of hits;
 - (2) Locations where wood posts are vandalized;
 - (3) Where driving a post is easier than digging a post-hole (in granular, loose, or rocky soil);
 - (4) Where the post is required to blend with the surrounding environment.

Decisions to use steel sign supports for replacement purposes will be the responsibility of the District and should be based on consideration of the above factors. Warehousing of all breakaway metal sign post systems is not anticipated at this time. Some orders may have to be placed through local distributors. Orders for a particular type of post must be justified.

M4.18 Timber Poles

Installation of new or replacement timber poles (non-dimensional lumber) is no longer acceptable when sign supports with yielding or breakaway characteristics are required. Timber poles may continue to be used where the sign location is protected or where the sign is not readily accessible to traffic.

Protected locations include those behind guardrail, bridge railing, or similar barriers; or on cut slopes where the sign posts are located four feet or more vertically above the edge of paved shoulder. When timber poles are used behind barriers, the barriers must be required for purposes other than just to protect the sign. Drilling of holes and sawing of weakened plane breakaway joints, will not be required at these locations.

Timber poles in existing locations may remain in place until damaged or otherwise directed to be removed by District Traffic Operations. Acceptable alternates for timber poles are the laminated box beam and breakaway steel supports for large signs. Combinations of timber poles and alternate sign supports will not be permitted in the same multi-post installation.

M4.19 Laminated Wood Posts

Breakaway holes must be placed at the proper height above ground to prevent the remaining stub from snagging the bottom of an impacting vehicle. See current Standard Plan sheets for hole locations.

A laminated wood post (high-grade plywood in appearance) has been approved for installation of large signs in areas exposed to traffic, where timber poles were formerly the standard.

Laminated posts are designed to meet Federal requirements for change in momentum during an impact by breaking cleanly when impacted by a lightweight vehicle (one 800 pound (362.88 kilograms) car) traveling at 20 mph (32.186 kilometers per hour).

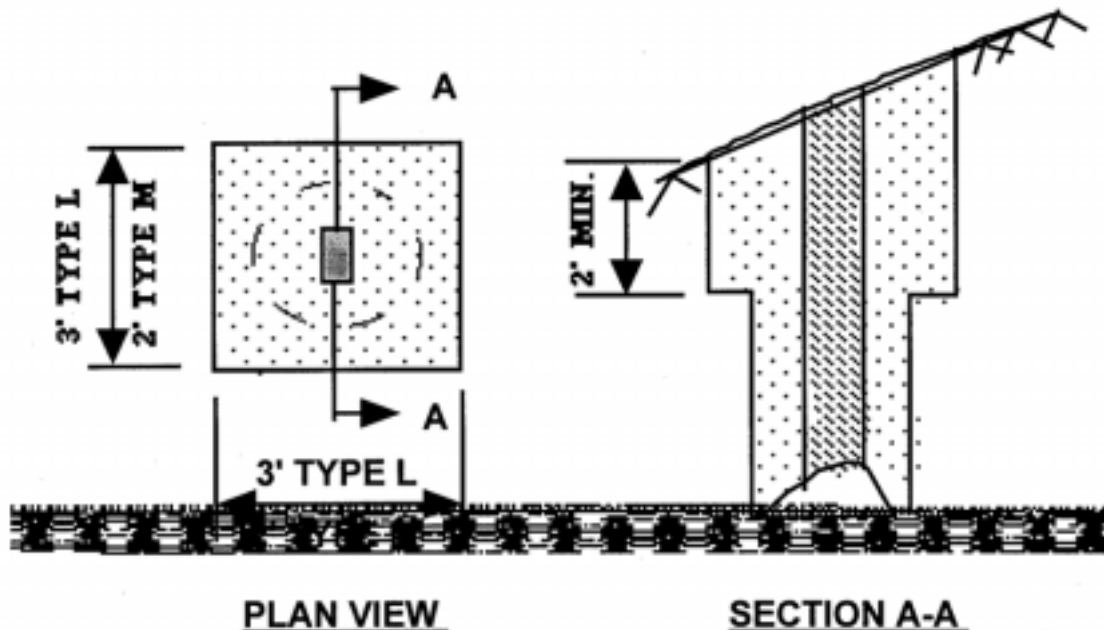
Laminated posts are relatively fragile and must be stored and handled carefully. See the Section M4.09 above for directions on storage and handling. Techniques for storing laminated box-beam sign posts require a minimum 6 inch (152.4 millimeters) clearance at the base of the pile, in addition to stickers placed between each layer of posts. Posts should be stacked on edge and the top of the pile should be covered with a layer of plastic or tarp to prevent rain from damaging the posts.

Some of the newer laminated wood posts are coated with special waterproofing material to minimize cracking and warping and give a longer service life. Re-coating of these posts may be beneficial in the future if field inspections indicate that the coating film is breaking down.

To ensure that laminated wood sign posts will break away properly when hit and still not be damaged by high winds, it is important that posts be installed in holes as specified and back-filled with a granular material. The relationship of hole size and soil condition is critical in assuring that there is a proper breaking away of the upper portion of laminated wood box beam posts when hit. The bottom must be held firmly in place to allow a clean break of the post at ground level. Soft or yielding ground will permit movement of the entire post and the desired type of breaking will not be accomplished.

Two alternative post-hole configurations have been approved for use:

- (A) If the ground is very firm, similar to compacted highway fill, the hole diameter may be reduced six inches in diameter. For these conditions the permissive size of hole is 18 inch (457.2 millimeters) for the type "M" post and 24 inch (609.6 millimeters) for the type "L" post.
- (B) If the foundation material surrounding the post is not firm when in a saturated condition, the 18 inch (457.2 millimeters) and 24 inch (609.6 millimeters) diameter holes mentioned above may be used only if the upper portion of the hole is modified to provide satisfactory lateral support. This modification is to be accomplished by removing at least 2 feet (.6096 meters) of the upper portion of the existing soil to the dimensions shown below and replacing with a granular backfill material.



M4.20 Breakaway Steel Posts for Use With Large Signs

The wide flange breakaway steel sign post, which meets the Federal requirements for change in momentum during vehicular impact, has been available for many years. Carefully follow plans that cover standard installations. Correct alignment of post sections and placement of bolts in the slip base is critical to proper functioning of the breakaway feature.

A major disadvantage of the steel breakaway post is the need to fabricate a new post every time an existing post is hit. This requires field measurement of the exact length required for replacement. Some time lag is inevitable before the steel post can be replaced.

M4.21 Overhead Steel Sign Supports

Overhead steel sign supports are designed by the Structures Program. Repairs are performed by contract unless the District has workers proficient in structural steelwork and painting.

M4.22 Hardware

All signs shall be affixed to posts with galvanized hardware. Fiber or nylon washers shall be used to protect the face of the sign. Placing a metal washer between the fiber/nylon washer and the bolt head is recommended to provide more bearing and reduce rocking of the sign on the post. Use 5/16 inch x 7/8 inch (7.938 millimeters x 22.225 millimeters) washers for 1/4 inch (6.35 millimeters) bolts and 3/8 inch x 7/8 inch (9.525 millimeters x 22.225 millimeters) washers for 5/16 inch (7.938 millimeters) bolts. An additional washer placed between the nut and the post will prevent the nut from digging into the post during tightening.

The threads near the ends of bolts protruding from sign posts may be "upset" or deformed to prevent the nut from being removed by vandals. Districts may also purchase commercially available "anti-theft" hardware for use in areas subject to vandalism and theft.

Large signs placed on laminated box beam sign posts must be installed using 1/2 inch (12.7 millimeters) lag screws for attaching sign panels to the post. Lag screw pilot holes drilled in wood flanges for attaching sign panels must be 5/16 inch (7.938 millimeters) in diameter so that the panels will not blow down in heavy winds.

Bolting completely through the post is not acceptable practice because the sign panel will not readily release from the support post during impact.

Overlay plates for making changes to existing signs (not made from steel) shall be attached using aluminum rivets. Stainless steel rivets shall be used on the older porcelain on steel signs.

Galvanized back braces should be used for installation of all large single sheet signs placed on one post. A special back brace is available for one-post directional signs installed "off-center".

One-post installations of signs 18 inch (.4572 meters) or more in depth require a small wood block between the center of the sign and the post to stiffen the sign and prevent "flutter" under some wind conditions. This block also causes the sign face to distort slightly, which reduces glare.

For details, see Standard Plan S42-15. Do not use a block more than one inch (25.4 millimeters) thick, as distortion will make the sign ineffective for night reflectivity

M4.23 Supplemental information

District Traffic Operations can provide current standards for each sign truck. Supervisors are responsible for assuring that the current drawings and standards are available for performance of work.

Upgrading (improving) existing installations to meet current standards is not normally funded from Maintenance allocations. Exceptions may occur where formerly used materials are no longer available, or where new materials can be expected to provide a longer service life, thereby reducing future maintenance costs.

These exceptions are normally justified at the Headquarters level, and instructions are transmitted to the Districts for implementation.

Sign crews should retain copies of old Standard Plans and other reference documents for maintaining existing installations. The intent of this instruction is to eliminate "upgrading" of existing installations using funds dedicated for maintenance purposes in conformance with the law.